PB-237 882-T

THE DEVELOPMENT METHOD 'BISCHOFF METHOD'

Knospe

Environmental Protection Agency
Research Triangle Park, North Carolina

July 1973

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308050

PB 237 882-T

EPA- TR. 34-74

THE DEVELOPMENT METHOD "BISCHOFF METHOD"

(Entwicklungsvorhaben "Bischoff-Verfahren")

by

Knospe

STEAG REPORT

The 41st (and last) intermediate report to the Labor and Social Ministry of the Land North Rhein-Westphalia, Dusseldorf, and the Land Office for Immission and Soil Conservation, Essen.

The Month of May 1973

a) Work on the Bischoff Installation

After the conclusion of the tests on April 30, 1973, the installation was not in operation during the month of May. According to agreement the following inspection and cleaning operations were carried out (The time requirements for the individual tasks can be seen from the attached sheet "Operating Plan of the Bischoff installation during May"):

1. Cleaning of the pipe lines and the water seals (with the exception of the wash tower).
2. Opening and inspection of the circulation pumps P1 to P4.

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b) Pump Inspection Results

Pump 1

Equipment: The parts subject to wear are made of the old materials (ERN and GG) with an artificial coating of the type "Flour-Stromit-wi" on an epoxy hard base.

Operation time: about 1600 hours.

Findings: The coating of the housing is almost completely gone; in addition there are 2 - 5 mm deep grooves at the edges of the wearing surface.
The coating of the rotor is retained (up to the edges). The areas at the edge of the pressure cap have no more coating. At the edge the metal is already worn away in places.

Pump 2

Equipment: The parts subject to wear are made of the old materials (ERN and GG) with the same artificial coating as was seen in Pump 1. The pressure caps in the housing are made of new materials (Cr-Ni-Steel).

Operating time: about 1200 hours.

Findings: The coating of the wearing surface under section 5 is worn off.
The wearing off of the metal is still in the beginning stages. The coating is missing on the rotor edges.
The pressure cap made of the new material shows no wear.

Pump 3

Equipment: The parts subject to wear are made of the old materials (ERN and GG) and are uncoated.

Operating time; about 1200 hours.

Findings: Light wear at the edge of the housing and on the edges of the rotor.

Pump 4

Equipment: The installed parts subject to wear (except for the housing) are made of the new materials (Cr-Ni-Steel).

Operating time: about 2300 hours.

Findings: The seal between the shaft and its protective housing must be renewed. All other parts subject to wear are in good condition.

Conclusion

The artificial coating of the parts subject to wear made of the old materials brings an improvement of the pumps' service slides but still no satisfactory solution.

The parts made of the Cr-Ni materials that were installed have given satisfactory results to date and show no appearances of wear. The best example for this is Pump 4 with the longest operating time at the highest solid content in the slow medium period.

The greatest wear is definitely shown by Pump 1. Here the slightly acidic operating conditions, caused by the liquid CaO content and the fine dust in the water, appear to cause increased corrosion and erosion.

c) Ground water analysis

Attachment 2 contains the analyses of the sediments in the ground water probes taken from the control wells by the Emschergenossenschaft Lippeverband on March 30 and April 18. The pH values which climbed in February in the wells 1 and 2 have again sunk to the previously normal values. The content of dissolved substances has climbed further, particularly in wells 1 and 3. All other values lie within the previously normal ranges.

d) Outlook:

The tests begun in March 1971 under the test program agreed to by STEAG, Bischoff and the LOISC, were concluded by STEAG on April 30, 1973. The monthly submission of reports ends with that period. The final report will be produced within 5 months.

In accordance with the agreement, the LOISC receives in addition copies of the monthly ground water analysis values from the control wells on the edge of the mud deposit.

The firm Bischoff will carry out a long term test under the optimal conditions, which have been found from the tests to date. It should be shown that the baking can be used in normal power plant operation.

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The reports give data on the Bischoff method for future operation in the Juliers power plants. Test on equipment and ground water are discussed.

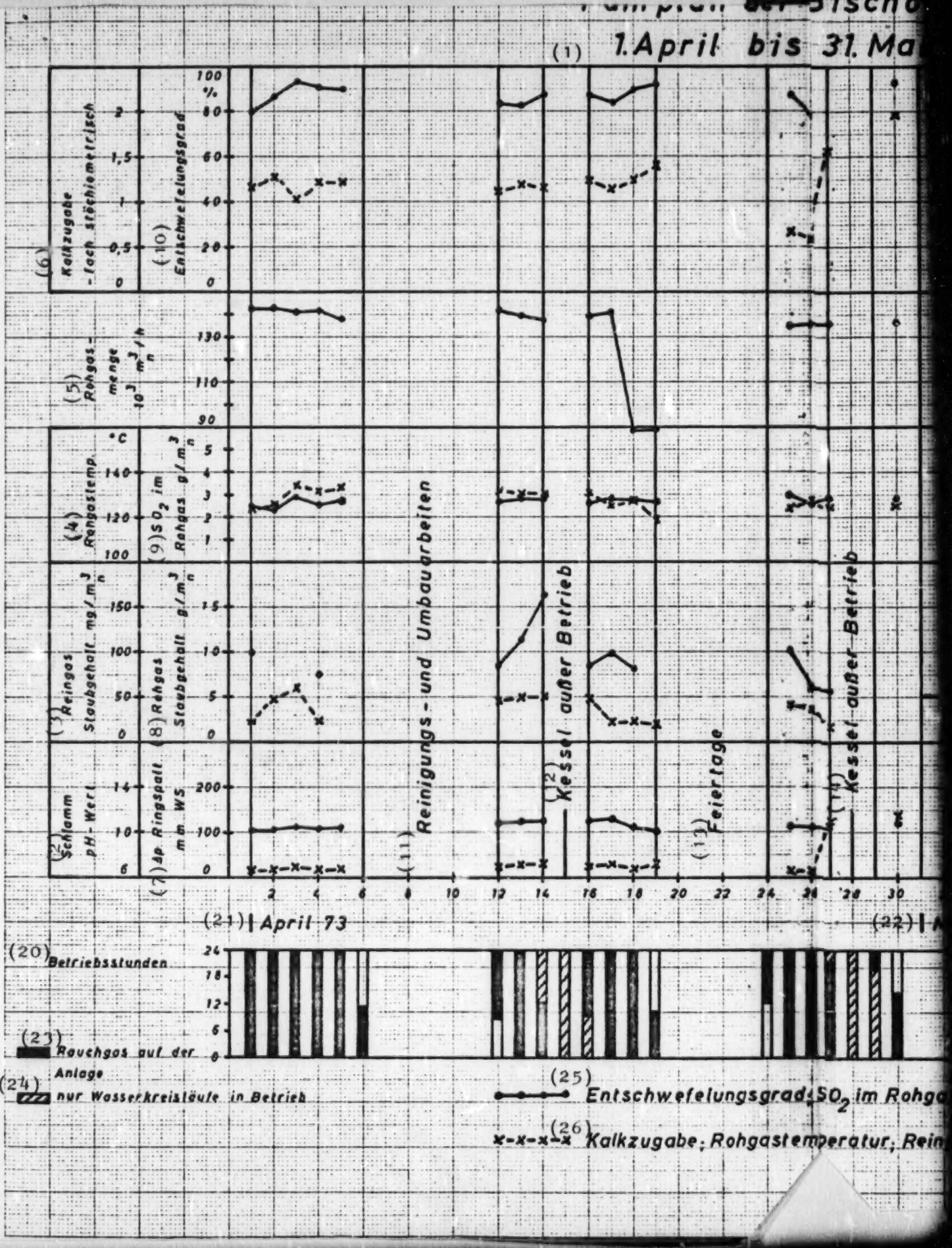
Enclosures

1. Ground Water Investigations at the Lunen Deposit

	2. Well water		3. Well 2		4. Well 3	
	5. March '73	April '73	March '73	April '73	March '73	April '73
6. Outward appearance						
7. Clarity	8. Very strong cloudiness	9. Weak cloudiness	10. Opal	11. Lightly opal	12. Lightly opal	13. Cloudy
14. Color	15. Yellow	16. Weak yellow	17. Very weak gray	18. Weak yellow	19. Very weak gray	20. Weak yellow
21. Odor	22. Earthy	23. Very earthy	23. Very earthy	24. None	23. Very earthy	23. Very earthy
25. Sediments	26. Gray, grainy	27. Brown, flaky	28. Gray, grains and filaments	29. Light gray sand and flakes	30. Gray grains and filaments	31. Gray-brown, flaky and sandy
32. pH values	7.3	7.0	7.3	7.0	7.4	7.1
33. Dissolved substances						
34. Total (mg/1)	1230	-	1090	-	1490	-
35. Residue on ignition	990	-	660	-	830	-
36. Calcium permanganate loss, filtered mg/1	54	12	13	30	12	10
37. Biochemical oxygen requirements in 5 days, filtered (mg/1)	17	2	2	1	2	1
38. Sulfate (SO_4'') mg/1	259	263	248	192	276	307
39. Sulfite (SO_3'') mg/1	< 1	< 1	< 1	< 1	< 1	< 1
40. Cyanide (CN') mg/1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

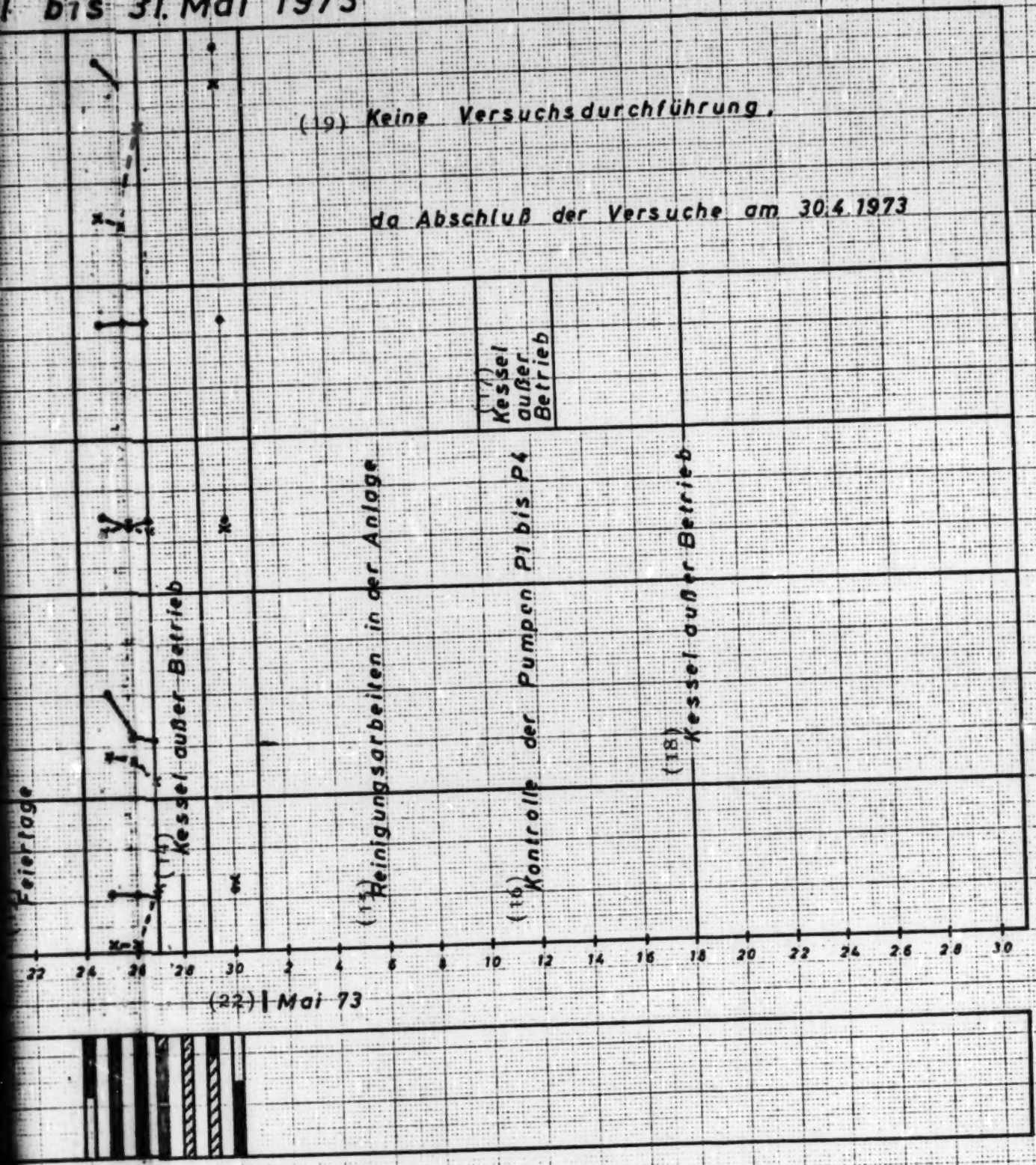
Translation of keyed items on enclosure 2

1. Operating Plan of the Bischoff Installation, April 1 to May 31, 1973
2. Sediment pH value
3. Pure gas dust content mg/m^3
4. Crude gas temperature
5. Crude gas quantity
6. Lime excess - stoichiometric multiple
7. ΔP ring slot
8. Crude gas dust content g/m_n^3
9. SO_2 in the crude gas g/m_n^3
10. Degree of desulfurization
11. Cleaning and reconstruction
12. Boiler out of operation
13. Holiday
14. Boiler out of operation
15. Cleaning work in the installation
16. Inspection of Pumps P1 to P4
17. Boiler out of operation
18. Boiler out of operation
19. No tests conducted, due to completion of the tests on April 30, 1973.
20. Hours of operation
21. April 1973
22. May 1973
23. Boiler gas in the installation
24. Only water circulation in operation
25. Degree of sulfurization; SO_2 in the crude gas; crude gas dust content; ΔP ring slot
26. Lime excess; crude gas temperature; pure gas content; sediment pH value


(1) 1. April bis 31. Ma
(6) Kalkzugabe - fach stöchiometrisch
(10) Entschwefelungsgrad
(5) Rohgas-menge
(4) Rohgastemp.
(9) SO2 im Rohgas
(3) Reingas Staubgehalt
(8) Rohgas Staubgehalt
(2) Schlamm pH-Wert
(7) Δp Ringspalt
(11) Reinigungs- und Umbauarbeiten
(12) Kessel außer Betrieb
(13) Feiertage
(14) Kessel außer Betrieb
(21) April 73
(22)
(20) Betriebsstunden
(23) Rauchgas auf der Anlage
(24) nur Wasserkreisläufe in Betrieb
(25) Entschwefelungsgrad SO2 im Rohgas
(26) Kalkzugabe; Rohgastemperatur; Rein

... Bischoff - Anlage

... bis 31. Mai 1973


(19) Keine Versuchsdurchführung,
da Abschluß der Versuche am 30.4.1973
(17) Kessel außer Betrieb
(18) Kessel außer Betrieb
(15) Reinigungsarbeiten in der Anlage
(16) Kontrolle der Pumpen P1 bis P4
(14) Kessel außer Betrieb
Feiertage
22 24 26 28 30 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
(22) Mai 73

...lungsgrad; SO_2 im Rohgas; Rohgas - Staubgehalt; Δp Ringspalt

... Rohgastemperatur; Reingas - Staubgehalt; Schlamm - pH - Wert